PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. II. 1845-6. No. 27.

SIXTY-THIRD SESSION.

First Ordinary Meeting, 1*st December* 1845.

Sir T. M. BRISBANE, Bart., President, in the Chair.

The following Communications were read:—

1. On the Sums of the Digits of Numbers. By the Right Rev. Bishop Terrot.

It was shewn, that, if the ultimate sums of the digits of the terms of any arithmetic series, whose difference is prime to the local value of the notation employed, minus 1, be taken, such sums will range, without any recurrence, through all the digits of the notation, and then recur in the same order as before. It was then shewn, that in any integer series formed upon a given law, the sums of the digits of the terms will have a fixed period of recurrence. This was proved in polygonal and figurate numbers, in the series of squares, cubes, &c., in the successive powers of a given root; in the series whose general term is $m.m+1 \;.\;.\;.\; m+r-1$; and in that whose general term is $x^{m}+a\,x^{m-1} \;.\;.\;.\;.\; +l$.

It was shewn, that whenever the *variable* or number of the term occurs as a multiplier, the sums recur after $\overline{n-1}$ terms, with certain definite relations between the intermediate terms. When the variable occurs as an index, then the recurrence was shewn to take place at shorter intervals; in the decimal notation, according as the root was of the form $3\,p$, or $3\,p \pm 1$. From the determination of the different periods of recurrence in the last case, it was shewn that every sixth power is of the form $9\,n$, or $9\,n+1$; and that every seventh power is of the form 9 *n*, or 9 *n* + the root employed.

2. Notes on the Topography and Geology of the Cuchullin Hills in Skye; and on the Traces of Ancient Glaciers which they present. Part 1.—By Professor Forbes.

The following Donations were reported as having been received since the close of last Session:—

Vestiges of the Natural History of Creation.—*By the Author.*

Report of the Fourteenth Meeting of the British Association for the Advancement of Science, held at York, in September 1844.—*By the Association.*

De l'Influence Curative du Climat de Pau et des Eaux Minerales des Pyrenées. Par M. A. Taylor, M.D.—*By the Author.*

A Catalogue of the Library of the Athenæum.—*By the Athenæum.*

The Transactions of the Royal Irish Academy. Vol. XX.—*By the Society.*

Journal of the Statistical Society of London. Vol. VIII., Parts 2, 3.—*By the Society.*

Memoirs and Proceedings of the Chemical Society. Parts 13, 15.—*By the Society.*

Outlines of Chemistry, for the Use of Students. Part 2. By William Gregory, M.D., Professor of Chemistry in the University of Edinburgh, &c.—*By the Author.*

Geschiedenis der Ioden in Nederland. Door M. H. J. Koenen.

Over Het Onmatig Gebruik van Sterken Drank en de Middelen om Helzelve te Keer te Gaan. Door A. W. F. Herckenroth.

Het Gebruik en Misbruik der Geestrijke Dranken. Door H. M. Duparc.

De Uitoefening de Geregtelijke Geneeskunde in Nederland. Door J. C. Van Den Broecke.

Uitkomsten der Meteorologische Waarnemingen, gedaan te Utrecht, in de Jaren 1839–43.—*By the Directors of the Provincial Society of Arts and Sciences at Utrecht.*

Natuurkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem.—*By the Society.*

The American Journal of Science and Arts, conducted by Professor Silliman and Benjamin Silliman junior, for April, July, and October.—*By the Editors.*

A Physiological Essay on the Thymus Gland. By John Simon, F.R.S.—*By the Author.*

On the Comparative Anatomy of the Thyroid Gland. By John Simon, Esq.—*By the Author.*

Astronomical Observations made at the Royal Observatory, Greenwich, in the year 1843, under the direction of George Biddell Airy, Esq., Astronomer-Royal.—*By the Royal Society.*

Reduction of the Observation of Planets, made at the Royal Observatory, Greenwich, from 1750 to 1830; computed by order of the Lords Commissioners of the Treasury, under the superintendence of George Biddell Airy, Esq., Astronomer-Royal.—*By the Royal Society.*

Philosophical Transactions of the Royal Society of London for the year 1845. Part 1.

Proceedings of the Royal Society, 1844. No. 60.—*By the Royal Society.*

Transactions of the Geological Society of London (Second Series). Vol. VII., Parts 1, 2.

Proceedings of the Geological Society of London. Nos. 99, 100, and 101.—*By the Geological Society.*

Annuaire Magnetique et Météorologique du Corps des Ingenieurs des Mines de Russie. Par A. T. Kupffer. 1842. Nos. 1, 2.—*By the Author.*

Etudes sur la Mortalité dans les Bagnes et dans les Maisons Centrales de Force et de Corrections de France depuis 1822 jusqu' a 1837. Par M. Raoul Chassinat, M.D.—*By the Author.*

Resultats des Observations Magnétiques faites à Gèneve dans les Annèes 1842 et 1843. Par E. Plantamour, Professeur d'Astronomie à l'Academie de Gèneve.—*By the Author.*

Astronomische Nachrichten herausgegeben von H. C. Schumacher, Nos. 536, 537, 538.—*By the Author.*

The Electrical Magazine, conducted by Mr Charles V. Walker. Vol. II., No. 9.—*By the Author.*

Journal of the Asiatic Society of Bengal, edited by the Secretary. Nos. 146 to 154.—*By the Society.*

Carte Géologique du Globe. Par M. A. Boué.—*By the Geological Society of France.*

The Twelfth Annual Report of the Royal Polytechnic Society, 1844.—*By the Society.*

Address to the Ethnological Society of London, delivered at the Anniversary Meeting. By Richard King, M. D.—*By the Author.*

Scheikundige Onderzoekingen, gedaan in het Laboratorium der Utrechtsche Hoogeschool. 3d Deel, St. 1, 2.—*By the Editors.*

Tijdschrift voor Natuurlijke Gescheidenis en Physiologie. Uitgegeven door J. Van der Hoeven, M.D., Prof. te Leiden, en W. H. de Vriese, M.D., Prof. te Amsterdam. Deel 12, Stuks 1, 2.—*By the Editors.*

On the Vision of Objects on and in the Eye. By William Mackenzie, M.D.—*By the Author.*

Journal of the Bombay Branch Royal Asiatic Society. April and October 1843.—*By the Society.*

Bulletin de la Société de Geographie (2^{de} Serie), Tomes XVI., XVII., XVIII., XIX., and XX.; and Tomes I., II. (3^{me} Serie.)—*By the Society.*

Memoires de la Société de Physique et d'Histoire Naturelle de Geneve. Tome X., Part 2.—*By the Society.*

Memorie della Reale Accademia delle Scienze di Torino. Vol. XXXIX.—*By the Society.*

Handbuch der Mineralogie. Von J. F. L. Hausmann. Zweite Theil. —*By the Author.*

Transactions of the Zoological Society of London. Vol. II., Parts 2, 3, 4, 5; and Vol. III., Parts 1, 2, 3.—*By the Society.*

Proceedings of the Zoological Society of London.—*By the Society.*

Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Gottingen. Band 2.—*By the Society.*

Nieuve Verhandelingen der Eerste Klasse van het Koninklijk Nederlandsche Instituut van Wetenschappen, Letterkunde en Schoone Kunsten te Amsterdam. Deel II.—*By the Institute.*

Annales des Sciences Physiques et Naturelles d'Agriculture et d'Industrie, Publiées par une Société Royale d'Agriculture, &c., de Lyon. Tome VII.—*By the Society.*

Pilote Français; comprenant les Cotes Septentrionales de France depuis les Roches de Porsal jusqu' au Phare des Heaux de Brehat. 6^{me} Partie.—*Par le Ministre de la Marine.*

Pilote Francais; Instructions Nautiques (Partie des Cotes Septentrionales de France comprise entre la Pointe de Barfleur et Dunkerque et entre les Casquets et la Pointe de Barfleur Environs de Cherbourg), Redigées par M. Givry. 2 Parts, 4to.—*Par le Ministre de la Marine.*

Proceedings of the Geological Society of London. No. 103.—*By the Society.*

Proceedings of the American Philosophical Society. Nos. 30 and 31.

A Public Discourse in commemoration of Peter S. Du Ponceau, LL.D., late President of the American Philosophical Society. By Robley Dunglison, M.D., one of the Secretaries.—*By the American Philosophical Society.*

Archæologia, or Miscellaneous Tracts relating to Antiquity, published by the Society of Antiquaries of London. Vols. I., II., XI., XII., XIV., XVI., XVII., XVIII., XIX., XX., XXI., XXII., XXIII., XXIV., XXV., XXVI., XXVII., XXVIII., XXIX., XXX., and Index.—*By the Antiquarian Society of London.*

Liber Quotidianus Contrarotularis Garderobæ anno Regni Regis Edwardi Primi, vigesimo octavo, A.D. 1299 and 1300.

A Catalogue of Ordinances and Regulations for the Government of the Royal Household, made in divers Reigns, from King Edward III. to King William and Queen Mary; also Receipts in Ancient Cookery.

Magni Rotuli Scaccarii Normanniæ sub Regibus Angliæ. Opera Thomæ Stapleton. 2 vols. 8vo.

Cædmon's Metrical Paraphrase of Parts of the Holy Scriptures, in Anglo-Saxon; with an English Translation. By Benjamin Thorpe.—*By the Antiquarian Society of London.*

Urologie-Traité des Augusties ou Retrecissements de l'Urethre leur traitement rationnel. Par le Dr Leroy-D'Etoilles.—*By the Author.*

Sullo Studio Comparativo delle Lingue Osservazioni Generali di B. Biondelli.—*By the Author.*

Etudes Philologiques et Historiques. Par le Dr Halbertsma. 2 Parts. *By the Author.*

Instructions Pratiques sur l'Observations et la mesure des Propriétés optiques appelées Rotatoires, avec l'exposé succinct de leur Application à la Chimie Medicale, Scientifique et Industrielle. Par M. Biot.—*By the Author.*

Maps of the Ordnance Survey of the County of Cork.—*By the Lord-Lieutenant of Ireland.*

Comptes Rendus Hebdomadaires des Séances de l'Academie des

Sciences. Tome XX., Nos. 12–26 ; and Tome XXI., Nos. 1–16.—*By the Academy.*

Proceedings of the Philosophical Society of Glasgow. Nos. 1–11. —*By the Society.*

Monday, 15th December 1845.

Very Rev. Principal LEE, V.P., in the Chair.

The following Communications were read :—

1. Notes on the Topography and Geology of the Cuchullin Hills in Skye ; and the Traces of Ancient Glaciers which they present—(concluded). By Professor Forbes.

The first part of this paper refers to the relations of the hypersthene rock of the Cuchullin Hills to the adjoining formations.

The author undertook the observations here detailed without the slightest view to publication. He made only brief notes on the spot, collected but few specimens, and drew the first sketch of a map which accompanies the paper, for his own amusement and information. Finding, however, that the published writings of geologists contained little or no notice of some facts which he had clearly established, he undertook this paper as a groundwork for future and more systematic researches.

The details of the geology of the Cuchullins which exist are almost all to be sought for in the Description of the Hebrides by Dr MacCulloch. The present writer has strong reason for believing that Dr M. acquired his chief information from following the coast in a vessel, and by an excursion to Coruisk, leaving out the more plain and instructive phenomena which the eastern and northern sides of the range present. Having walked completely round the Cuchullin group, and ascended two of its principal summits, the author thinks that he has established the exact boundary of the hypersthene rock on the eastern and northern sides, stretching from Ben Blaven, which is included within the hypersthene line, by the eastern base of Scuir-na-Gillean, under the northern slope of Bruch-na-Fray, and so round to Loch Brittle, where it becomes less well defined, the hypersthene rock graduating into the common trap of that country. But along the boundary first described the hypersthene may be seen overlying the claystone of the Red Hills, and forming a sort of huge bed dipping at a moderate angle with the horizon from NW. to SE., and probably thinning out in the latter direction. In confirmation of this view, it is stated that the junction of the hypersthene and claystone occurs at a height of 2050 feet on the northern slope of the Cuchullins, all below being common trap; but the junction descends to the very bottom of Glen Sligachan near Loch-na-Nain, which is little elevated above the level of the sea. The hypersthene appears to have a decidedly slaty structure parallel to this bed, which, with its singularly intractable nature, and its resistance to weathering, occasions the jagged forms for which it is so celebrated. The author believes that it has a triple cleavage, one parallel to the bed and two perpendicular to it; and that the numerous claystone veins which traverse the mass of hypersthene up almost to the very summit, have, likewise, a threefold direction parallel to these cleavages. The author thinks that the posteriority of the hypersthene to the neighbouring rocks is probably deducible from the facts which he mentions.

The second part of the paper refers to what he considers unequivocal traces of glacier-action in many directions around and amongst the Cuchullin Hills. These are principally—

(1.) Furrowed and striated rocks and *roches moutonnées*, undistinguishable in kind from those in the Alps, and, if possible, rendered more remarkable from the unparalleled hardness and toughness of the rock operated on, and the palpable incongruity which these forms present to those natural to the hypersthene rock. These furrows are to be seen parallel to the direction of the different ravines of the Cuchullin Hills, and that at all points of the compass, thus radiating from this little mountain group as a centre, and clearly localizing the cause—the wonderful mechanical cause—which has produced such a phenomenon; which, when the nature of the rock is taken into account, must be considered as one of the most wonderful instances of abrasion of which the world presents an example.

(2.) Coupled with this is the transportation of angular blocks of immense mass, transported over chasms, and lodged high and dry in fantastic positions on ledges of rock, and on the summit of the ice-worn domes of smoothed hypersthene. These phenomena, so well seen at Coruisk, and so graphically described, though unexplained or misunderstood, by Dr MacCulloch, are in all respects analogous to the *blocs perchés* of the Alps. Of banded and terminal moraines examples are pointed out in radiating directions, east, north, and west from the Cuchullin group, completing the evidence for the origination of the requisite force within the Cuchullin group itself. Other localities appear to exhibit traces of a great and general wave which has acted parallel to itself over a vast extent of country; but here no such explanation can apply, and in steep ravines, scarcely half a mile long, we cannot imagine the generation of vast and repeated waves, or floating icebergs or pent-up lakes, as any of the machinery which has elsewhere been used to account for facts less stubborn than those presented by the adamantine surfaces of the Cuchullin hills.

2. On the recent Eruption of Hecla, and the Volcanic Shower in Orkney. By Dr Traill.

Dr Traill read an account of dust falling from the atmosphere on the 2d and 3d of September last, in the islands of Orkney.

This dust was observed by a gentleman in the island of Rousay, falling from the air in the morning of the 2d. It was collected by another at Skaill, on the western shores of Pomona, on the morning of the 3d; and by two other gentlemen in Kirkwall on the same day. It appears also to have fallen in several other parts of Orkney, probably over all the islands; and was observed also to reach the northern coasts of Caithness, within an area of which the radius cannot be less than 30 or 40 miles.

It covered, to the depth of from $\frac{1}{12}$ to $\frac{1}{6}$ inch, linen laid out to dry, glass frames in gardens, and the leaves of plants of every kind, with a fine brownish-grey dust, almost impalpable to the touch, but meagre and crowding between the teeth. It does not effervesce with acids, and consisted chiefly of silex, alumina, oxide of iron, with a trace of lime.

This dust bears much resemblance in composition and appearance to that which covered the decks and rigging of vessels in the West Indian seas, when the eruption of the Soufrière took place in St Vincent, in 1812. Those who collected the dust in Orkney, state the probability that it proceeded from some eruption of Hecla, as the ashes of that volcano *once* before fell in Orkney; and the wind for several days before the 2d of September had blown strongly from the NW.

The truth is, that such an occurrence has at least three times before happened in the Orkney and Zetland Isles, when there has been an eruption in Iceland. In 1755, during a violent eruption of the Köttlugiær Jökul, showers of ashes fell in the Zetland isles. In 1766, during a great eruption of Hecla, showers of ashes reached the Orkneys, and were long remembered there under the name of the *black snow*. Again, in 1783, a similar dust was observed to descend in Orkney, which was coincident with a terrible eruption of the Shaptär Jökul; the most calamitous which ever happened in Iceland.

Thus, the volcanic ashes of that island have thrice before reached our northern islands; and recent intelligence brought by Danish fishing vessels from Iceland announces, that, in the end of August, Hecla, after being quiescent since 1766, has emitted a violent eruption from its flanks; and there can be little doubt that the dust now exhibited is derived from that eruption.

The distance between Hecla and the Orkney Islands is about 550 miles. Volney and other writers assure us that the ashes of Etna are often carried to the plains of Egypt, or to double that distance; and the eruption of the Tomboro, as described by Raffles, in the eastern archipelago, appears to have exerted a no less astonishing projectile force.

The following Donations were announced:—

Journal of the Asiatic Society of Bengal, 1844, No. 145.—*By the Society.*

The Transactions of the Linnean Society of London, Vol. XIX., Part 3, 4.

Proceedings of the Linnean Society of London. Nos. 19 to 26.—*By the Society.*

Archives du Museum d'Histoire Naturelle, publiées par les Professeurs-Administrateurs de cet Etablissement. Tome IV., Liv^{res} 1, 2.—*By the Editors.*

The Second Annual Report of the Agricultural and Horticultural Society of Auckland.—*By John Johnston, M.D., President.*

Waarnemingen en Proeven over de onlangs Geheerscht Hebbende Ziekte der Aardappelen. Door G. Vrolik, M.D.—*By the Author.*

Œuvres de La Place, 4 Tomes.—*Par Le Ministre de l'Instruction publique de France.*

Monday, *5th January* 1846.

Sir T. MAKDOUGALL BRISBANE, Bart., President, in the Chair.

The following Communications were read:—

1. On a new variety of Gamboge from the Wynaad. By Dr Christison.
2. Results of the Makerstoun Observations, No. 1. On the Relation of the Variations of the Earth's Magnetism to the Solar and Lunar Periods. By J. A. Broun, Esq. Communicated by Sir T. M. Brisbane, Bart.

The observations from which the following results are deduced, were obtained during the years 1844 and 1845, by means of the bifilar magnetometer, described in the Makerstoun Observations for 1841 and 1842; they are corrected for temperature by a method previously described.*

From the Observations for the year 1844, the diurnal variation of the horizontal force is found to consist of two maxima and two minima; *the* minimum occurs at $10^h\ 20^m$ A.M. (Makerstoun mean solar time is used throughout), *the* maximum at $5^h\ 30^m$ P.M.; a minimum occurs at $2^h\ 20^m$ A.M., and a maximum at $5^h\ 30^m$, or 40^m A.M.: two inflexions occur in the mean curve between 3^h and 4^h P.M., and between 8^h and 9^h P.M. The periods of maxima and minima vary throughout the year, and the morning maximum is greater than the afternoon maximum in winter.

The diurnal range is greatest in July and least in January; the mean of the ranges for these two months, the range for the month of March and for the month of October, are each nearly the mean diurnal range for the year.

The author shewed to the Physical Section of the British Association in June 1845, that the Makerstoun Observations for 1842 indicated a well-marked annual period of horizontal force, consisting of maxima near the solstices, and minima near the equinoxes; in correcting the Toronto Observations for 1842, by the method already noticed, he had arrived at the same result. He has now verified this period from the Makerstoun Observations for 1843, 1844, and 1845.

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* Transactions of the Royal Society of Edinburgh, Vol. XVI. Part. 1.

The mean horizontal force for each month is nearly the same as the mean for midnight and for 1^{h} P.M.

The secular variation is positive, the increase being considerably less for 1845, than for any of the previous years.

When the annual variation is eliminated from the means for each month, the author finds that the secular variation is scarcely sensible about 6^{h} 40^{m} A.M., an hour *after* the morning maximum, in the first six months of the year 1844, and about 4^{h} 40^{m} P.M., an hour before the afternoon maximum, in the last six months of the same year.

A lunar period for the horizontal force has been deduced, which (like the annual period, and the sun's declination) shews maxima when the moon has its greatest N. and S. declination, and minima between these periods. Each of the years 1844 and 1845 give nearly the same result.

The author has also deduced a period depending on the moon's phase or synodical revolution, consisting of a maximum of horizontal intensity, about two or three days after the new moon, and a minimum about two or three days after the full moon: this period is shewn with the same distinctness and regularity in each of seven months of 1844.

The Observations for 1844 and 1845 have each been investigated for the determination of a period connected with the moon's hour angle; the author finds this period to consist of two maxima and two minima. From the Observations for 1844, *the* minimum occurs about 5 hours before the moon's meridian passage, *the* maximum about 1½ hours after the passage of the inferior meridian; a maximum occurs before 4^{h} after the meridian passage, and a minimum about 8 hours after the meridian passage. These periods have been verified by the Observations for 1845, excepting that, for 1845, the secondary maximum occurs before 3 hours after the meridian passage: the range for each year is nearly the same, being about a tenth part of the mean diurnal range for the year.

3. Experiments and Investigations as to the influence exerted over some Minerals by Animal and Vegetable matter, under certain conditions. By Mrs Margaret Henrietta Marshall. Communicated by Sir T. M. Brisbane, Bart.

It occurred to the author, while examining the fossils of various strata, that possibly the animal matter of the animals originally included in the rock might have played some part in its consolidation, and thus, after their destruction as living animals, they might have continued to serve a useful purpose.

After many unsuccessful experiments, made with common lime, and raw animal or vegetable matter, she had recourse to sulphate of lime, and found that plaster of Paris, when mixed with water, and with not more than $\frac{1}{128}$th part of the weight of the whole mass of mixed animal and vegetable matter, it did not set instantly, but continued for some hours quite plastic, developed, in setting, more heat than usual, and finally acquired a remarkable degree of hardness, and the power of resisting both water and fire to a very great degree. A specimen, was exhibited, made in this way.

In other specimens, three parts of sand had been mixed with one of gypsum, and $\frac{1}{64}$th of the whole of iron had been added, with the same amount as before of organic matter. One specimen had been exposed for two years to running water, and was but little affected.

Time and exposure have a most remarkable effect in increasing the hardness and compactness of these mixtures.

Specimens were shewn of Arran granite, broken down and reconsolidated by means of $\frac{1}{10}$th of gypsum, and the usual proportion of organic matter. One of these has even taken a certain amount of polish. The author suggests, that possibly granite may, in some cases, have been brought into its present state, not by fusion, but by the combined agency of fire and water. She expects a favourable result from an attempt to consolidate granite without gypsum, which is now in progress.

Marine sands may be consolidated by the same means as those above employed, but more slowly. Several specimens were exhibited, one with an alga imbedded and well preserved. Liquor of mussels and sea-weeds were found to yield sufficient animal and vegetable matter to effect consolidation.

In several specimens, star fish and other mollusca were imbedded, and generally continued distinctly visible. They also discharged the colour of iron from the parts surrounding them.

The animal and vegetable matter used by the author was glue and starch, in her first experiments with gypsum; but in those made with marine sands, and those in which remains were imbedded, she employed the animal matter contained in the liquor of mussels, and the vegetable matter of fuci. The materials were boiled together, and then left for a longer or shorter time till consolidation took place.

As gypsum, which was used in most of these experiments, does not occur in the strata supposed to have been possibly consolidated by the action of animal and vegetable matter, the author, to ascertain whether gypsum might be dispensed with, employed pure magnesia, and with success. Specimens of consolidated magnesia were shewn. From some other experiments, the author is inclined to believe that animal matter, fossilized in the centre of a mass containing lime, attracts to itself the lime from the general mass.

Further experiments must determine how far the observations of the author are capable of being applied to explain any part of the phenomena of the consolidation of strata, or of the fossilizing of organic remains.

The following Gentlemen were duly elected Ordinary Fellows of the Society:—

Dr Taylor, of Pau.
Dr Pagan, F.R.C.S., Edinburgh.

The following Donations to the Library were announced:

Recueil des Actes de la Séance Publique de l'Académie Impériale des Sciences de Saint Petersbourg, tenue le 29 Decembre 1844.

Memoires de l'Académie Impériale des Sciences de Saint Petersbourg (Sciences Politiques, &c.) Tome V., Liv^{res} 5 and 6.

Memoires de l'Académie Impériale des Sciences de Saint Petersbourg (Sciences Mathematiques, &c.) Tome IV., Liv^{res} 6.

Memoires de l'Académie Impériale des Sciences de Saint Petersbourg (présentés par divers Savans.) Tome IV., Liv^{res} 6.—*By the Academy.*

Catalogue of the Edinburgh Subscription Library, 1794–1846.—*By the Office-Bearers of the Library.*

Journal of the Statistical Society of London. Vol. VIII., Part 4.—*By the Society.*

Proceedings of the Geological Society of London. Vol. IV., No. 104. —*By the Society.*

The Journal of Agriculture, and the Transactions of the Highland and Agricultural Society of Scotland. January 1846.—*By the Society.*

Journal of the Asiatic Society of Bengal, Nos. 146 and 147.—*By the Society.*

The Derivation of many Classical proper Names from the Gaelic Language, or the Celtic of Scotland. By Thomas Stratton, M.D.—*By the Author.*

Monday, 19*th January* 1846.

Right Rev. BISHOP TERROT, V.P., in the Chair.

The following Communications were read:—

1. On the Action of Soluble Lead Salts on Natural Waters. By Professor Connell.

In a former communication to the Society, the author noticed that spring, well, and river waters, even after being boiled, usually yield, with acetate of lead, a precipitate readily soluble, in whole or great part, in acetic acid; and as the solution appeared not to be attended with effervescence, it was conceived to be due to organic matter. The author has since found that effervescence is more common than was at first supposed, and in that case the precipitate is due to the presence of carbonate of lime in the water. It was ascertained by boiling a solution of carbonate of lime in water containing excess of carbonic acid, that the trace of carbonate of lime retained in solution after ebullition, was too slight to explain the reaction of the spring waters, on the idea that it had been originally taken up by them in this way. It was farther found that distilled water, when left in contact for several days in a close vessel with impalpably pounded marble, took up a very little more; but what the author conceives to be the more probable source of the carbonate of lime in the spring waters is double decomposition between a soluble lime-salt and a carbonated alkali. The reaction may be imitated by adding to an ounce of distilled water one drop each of carbonate of potash, muriate of lime, and sulphate of magnesia, when acetate of lead will be found to yield a cloud like spring waters, soluble with effervescence in acetic acid. When the precipitate in the spring water is truly dissolved without effervescence by acetic acid, it is due to organic matter, provided no chloride is present in sufficient quantity to produce the reaction.

2. Claudia and Pudens; an attempt to shew that the Claudia mentioned in St Paul's Second Epistle to Timothy, was a British Princess. By Archdeacon Williams.

The following Donations to the Library were announced:—

Third Bulletin of the Proceedings of the National Institute for the Promotion of Science at Washington. February 1842 to February 1845.—*By the Institute.*

Tenth Letter on Glaciers.—*By Professor J. D. Forbes.*

Notes on the Topography and Geology of the Cuchullin Hills in Skye, and on the Traces of Ancient Glaciers which they present. By Professor J. D. Forbes.—*By the Author.*

Journal of the Asiatic Society of Bengal. No. 158.—*By the Society.*

The Electrical Magazine. Conducted by Mr Charles V. Walker. October 1845.—*By the Editor.*

The Journal of the Royal Geographical Society of London. Vol. XV., Part 2.—*By the Society.*

Bulletin de la Société de Geographie. Tome III., of 3d Series.—*By the Society.*

Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. 1843.

Bericht uber die zur Bekanntmachung geeigneten Verhandlungen der Konigl.-Preussische Akademie der Wissenschaften zu Berlin. Juli 1844 bis June 1845.—*By the Academy.*

Novorum Actorum Academiæ Caesareæ Leopoldino-Carolinæ Naturæ Curiosorum voluminis decimi noni Supplementum et volumen vigesimum.—*By the Academy.*

Scheikundige Onderzoekingen gedaan in het Laboratorium der Utrechtsche Hoogeschool. Deel III., Stuk. 3.—*By the Editors.*

Monday, 2d February 1846.

Sir T. M. BRISBANE, Bart., President, in the Chair.

The following Communications were read :—

1. On the Decomposition and Dispersion of Light within Solid Bodies. By Sir David Brewster, K.H.

After noticing various cases of solid and liquid bodies, which disperse light of a colour quite different from the transmitted tint, and Sir John Herschel's explanation of the phenomenon in the solution of acid sulphate of quinine, which, although itself colourless, disperses light of a bright blue, the author considers—

1. The internal dispersion of fluor-spar. By employing a more intense light than Sir J. Herschel did—namely, a condensed beam of the sun's light—he conceives that he has proved that the dispersion is not, as Sir J. Herschel supposes, superficial or epipolic, but, on the contrary, belongs, in some specimens at least, to every part of the crystal. The phenomenon is only seen in the green fluor of Alston, and in some pink and bluish-yellow varieties from Derbyshire. Some specimens are formed of strata alternately dispersing and non-dispersing. The author has not found the same appearances in any other mineral; but he has observed similar phenomena of dispersion in several kinds of glass, and even in some colourless glasses, which disperse a fine green tint.

2. On the internal dispersion of the acid solution of sulphate of quinine. Here, also, by using a more intense light than Sir J. Herschel, the author establishes that the peculiar dispersion occurs, not only in a stratum 1-50th of an inch thick at the surface of the liquid, but at all parts of it ; and he concludes —*First*, That a beam of light, epipolised by the action of a solid or a liquid, is capable of further dispersion, provided the thickness of the medium has not been sufficient to disperse all the dispersible rays. *Secondly*, When such a medium is thus rendered incapable of dispersing more light, it is not, as Sir J. Herschel supposes, because the light has lost a property which it previously possessed, but because it has been deprived of all the dispersible rays it contained.

The rays thus dispersed are few in number, and, by their mixture, yield blue light, but they extend over a great range of refrangibility; while other rays, equally refrangible, are either less dispersible, or not dispersible. But this appears less surprising when we advert to the phenomena of absorption.

The difference between absorption and dispersion is, that, in the former case, the absorbed light is extinguished; while, in the latter, the dispersed light is visible. Hence, if, in powerfully absorbing bodies, the absorbed light could be rendered visible, we should have the phenomena of epipolised light.

3. On the polarisation of dispersed light. Sir J. Herschel had failed to detect the polarisation of epipolised light; but the author, by using a condensed sunbeam, discovered that the dispersed beam was polarised, partly in the plane of reflexion, and partly in a peculiar manner; which the author calls *quaquaversus* polarisation, like that effected by a congeries of small doubly-refracting crystals, having their axes in all directions. He afterwards discovered instances in which each of these kinds of polarisation was found alone. These experiments have led to more extended investigations, to be subsequently communicated. The remainder of the section contains a minute description of the beautiful phenomena of the polarisation of dispersed light. The author thinks it probable that the study of these phenomena may throw much light on the internal structure of the substances exhibiting them.

4. On the causes of the decomposition and internal dispersion of light. The author ascribes the phenomena (which do not, in fluor-spar, belong to the species, but only to certain varieties) to irregular crystallisation, and the successive deposition of strata of different refractive and dispersive power. He does not, at present, offer any theory of the cause in liquids.

2. A few Remarks suggested by Professor Forbes's Description of the effects of Glacial Action among the Cuchullin Hills, and Mr Maclaren's views of the facts observed by him at the Gareloch. By Sir G. S. Mackenzie, Bart.

The object of this paper was to shew, that if it be assumed that glaciers had actually existed among the Cuchullin Hills, or in other parts of this country, one of two conditions must necessarily have been present—either a climate much colder than the existing climate of Scotland, or a higher position of the land where the supposed marks of glaciers are seen. With respect to the first condition, the permanency of the relative positions of the heavenly bodies, and of the inclination of the earth's axis, and the adaptation to existing climates of animal and vegetable life, were appealed to as rendering it improbable. The other condition was maintained as probable, on the ground that the changes which have undoubtedly taken place in the positions of the rocky masses forming the crust of the earth, prove that parts of these masses had been depressed, while others had been elevated; so that the probability was, that the Cuchullin Hills had stood at a higher elevation than they do at present, reaching above the line of perpetual congelation.

The crust of the earth having been broken up, was formerly propounded by the author of this paper as having been the cause of such a disturbance of land and water, as would fully account for all the phenomena now presented by the surface of the globe. It was stated, that, while no proof could be brought to shew a change of climate, we had evidence in abundance of intense internal heat, which has been known to have produced force sufficient to elevate the land. Nothing seems more likely, when the bursting of the crust gave vent to the expansive matter, than the sinking of much of the crust into the vacuities produced by its escape, and the tilting up of the rest; thus giving to the surface its present rugged and uneven aspect. During such a convulsion, masses bearing glaciers may have sunk with them below the line of perpetual congelation.

The observations on Mr M'Laren's theory, which ascribed two different co-existing phenomena (striated marks and travelled boulders) to two causes—the one glaciers, and the other icebergs—went to shew, that, if a glacier had existed in the Gareloch, it would be necessary to determine whether the boulders were deposited, and the glacier was formed before or after the rising of the sea, and after its subsidence; the sea having been supposed to have risen 2000 feet, to admit of icebergs bearing boulders floating into the Gareloch. This elevation of the level of the sea had not been accounted for in any way; nor had it been considered that the supposition involved its having risen all over the globe; and no space had been provided to receive it when it retired. It was shewn that, in such a condition of things, Scotland must have been a cluster of small islands, the summit of the present mountains, which certainly would have had a climate colder than the country generally has now. But it was also shewn, that were the sea elevated, as supposed, 2000 feet higher than at present, the regions where icebergs exist now would have been a solid mass of immoveable ice, extending far above and beyond the land from which icebergs, in our day, are occasionally detached. It was supposed that the phenomena described by Mr M'Laren could be well accounted for by the effects of the crust of the earth having burst. The author did not enter on this subject.

3. Remarks on certain grooved surfaces of Rock on Arthur's Seat. By the Rev. Dr Fleming.

Dr Fleming read a paper, entitled "Remarks on certain grooved surfaces of Rock in Arthur's Seat." He referred, in the first instance, to the surface of the bed of porphyry, known as the Bog Crag, and contiguous to the Hunter's Bog; and shewed, from the directions of the markings being neither parallel to the valley, nor the neighbouring cliff, that they could not be the result of glacial, diluvial, or iceberg action, but were probably caused by the sliding of the contiguous beds at their upheaval; and this view he considered strengthened by the state of the detritus of the cliff of the Well Crag. He then took notice of a grooved surface of basalt, contiguous to a singular trough to the east of St Anthony's Well, but which might have been produced either by glacial or diluvial action.

The following Gentlemen were duly elected Ordinary Fellows of the Society.

The Rev. Dr JAMES ROBERTSON, Professor of Church History.
Mr J. A. ADIE, Civil-Engineer.

The following Donations to the Library were announced.

Annuaire de l'Observatoire Royal de Bruxelles, par E. Quetelet, Directeur de cet Etablissement, pour 1845.

Annuaire de l'Academie Royale des Sciences et Belles Lettres de Bruxelles, pour 1845.

Bulletins des Séances de l'Academie Royale des Sciences et Belles Lettres de Bruxelles, 1844, Nos. 9, 10, 11, 12, and 1845, Nos. 1, 2, 3, 4, 5, 6.

Annales de l'Observatoire Royal de Bruxelles, publiées aux frais de l'Etat, par le Directeur A. Quetelet. Tome IV.

Nouveaux Memoires de l'Academie Royale des Sciences et Belles Lettres de Bruxelles. Tomes XVII. and XVIII.

Memoires Couronnés et Memoires des Savants Etrangers publiés par l'Academie Royale des Sciences et Belles Lettres de Bruxelles. Tomes XVII. and XVIII.—*By the Academy.*

Memoire de Simon Stevin, par A. Quetelet.—*By the Author.*

The Geology of Russia in Europe and the Ural Mountains. By Roderick Impey Murchison, Edouard de Verneuil, and Count Alexander von Keyserling. 2 vols. 4to.—*By the Authors.*

The American Journal of Arts and Science, conducted by Professor Silliman, for January 1846.—*By the Editor.*

Monday, 16*th February* 1846.

Dr CHRISTISON, Vice-President, in the Chair.

The following Communications were read :—

1. Biographical Notice of the late Sir John Robison, K.H., Sec. R. S. Ed. By Professor Forbes.

" A laudable usage was formerly more prevalent in this Society than it is at present, of recording the merits and services of persons who have conferred honour upon it by the one, or rendered themselves its benefactors by the other. Some very elaborate biographies have thus been communicated ; but, in the old " History of the Society" (to which our published " Proceedings" are in some degree parallel), numerous short notices are to be found of a kind imposing less labour on the biographer, and admitting of more extensive application than the larger memoirs just alluded to. In the hope that such notices may be more frequently contributed, I beg now to offer, within the short compass in which the very limited materials now at my disposal enable me to condense my task, a brief notice of the Life of the late Sir John Robison, whose most energetic efforts were, for many years, constantly directed to the promotion of the welfare of this Society ; a circumstance which seems to call for more specific notice than was comprised in the thanks and acknowledgment voted by the Society during his lifetime,* and which naturally devolves upon me the duty of drawing it up, not only as his successor in office, but as having enjoyed his friendship, and having been, on several occasions, indebted to him, in no common degree, for personal kindness.

" Sir John Robison was born on the 11th June 1778. His father was the late eminent Dr Robison, Professor of Natural Philosophy in our own University, and Secretary of this Society, who died in 1804 ; and his mother, formerly Miss Wright, still survives him, at an advanced, but robust old age.

Transactions of the Royal Society of Edinburgh, vol. XV., p. 680.

"Mr Robison was educated at the High School of Edinburgh, and afterwards attended some classes at College, including, of course, his father's, who, perceiving in him a decided mechanical turn, removed him from thence, after three years' study, and placed him under the charge of his old and valued friend, Mr Houston of Johnston, near Paisley, who was at that time erecting extensive manufactories upon his estate for the spinning of cotton, with the advantage of the then recently invented machinery of Arkwright. Here Mr Robison appears to have acquired the taste for constructing and superintending machinery, which remained with him during life. Two or three years afterwards, Mr Robison was removed to Manchester, where he remained in some degree under the protection of the late Mr Watt, whom, it is probable, that he visited at Soho, and made there the acquaintance of the younger Mr Watt, and the other members of that celebrated establishment. His father's great intimacy with the illustrious inventor (as he must in strictness be termed) of the steam-engine, and the great mutual services which these eminent men had rendered to one another (by far the greatest, however, in the ordinary acceptation of the term, being conferred by Dr Robison), of course, introduced Mr Robison with the utmost advantage to an establishment, then not only the first, but the only one of its kind, and must naturally have strengthened his own bent towards mechanics, and introduced him to more enlarged and correct notions of engineering than he was likely to attain in the direction even of the greatest cotton factory. I mention these circumstances now, because, though little information has reached me of his early connection with the Soho establishment, there can be no doubt that it exerted the most important influence on his future life, and the friendships which he then formed were amongst the most valuable, and, to the honour of all parties, the most lasting which he enjoyed, as we shall presently see.

"The truth of what I have now stated, as to the probable enlargement of his views and knowledge by his intercourse with Mr Watt, will appear from the speedy change in his professional views which followed upon his visit to Manchester; for, having remained in business there only a year or two, he obtained, through the influence of his father's friend, General Hay Macdowall, in 1802, a mercantile situation in Madras,* which occasioned his being sent up the country to Hyderabad, to establish a branch of the business for the purpose of collecting and transmitting the muslins and other manufactures of the natives. His activity and mechanical tastes did not, however, probably find sufficient scope in this merely mercantile position, which offered nothing resembling the superintendence of the machinery to which he had been accustomed at Johnston and Manchester; and he managed, under favour of circumstances which are unknown to me, so to improve his relations with the natives, and with the native prince the Nizam, in whose territories he resided, that he contracted for the establishment and maintenance of the artillery corps in his Highness's service, including the furnishing of guns and ammunition. Of this concern Mr Robison was not only the upholder, but also the commanding officer; the subordinate officers were appointed by him, and every expense defrayed. In security for the annual charge thus incurred, the taxes of a particular province or district were assigned over to him. Every branch of artillery-engineering must therefore have become familiar to him, and probably constituted one chief attraction of his situation. I understand that he obtained from England the very best implements of manufacture, but we may easily conceive the scope given to his remarkable ingenuity in conducting so extensive an undertaking in so remote a place. He always spoke with admiration of the intelligence and mechanical talents of the natives.

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* It would appear from a letter addressed to him by Mr Watt junior, which is still preserved, that his first destination was to Ceylon.

" His contracts were fulfilled, as I understand, with satisfaction to his employer, and profit to himself. His mechanical skill, and his acquaintance with the advanced state of Art in Britain, were duly appreciated by the Nizam, who desired him to construct and lay out a house and grounds on the English model, and to procure for him many European conveniences. The best understanding existed between them, until having realized a competence and desiring to return once more to society and his home, he left India in 1815, being then thirty-seven years of age. His father having been long dead, he settled in the west of Scotland, and married, the following year, Miss Grahame of Whitehill, who died in 1824. He, subsequently, married Miss Benson, who also predeceased him. Two daughters by his first marriage survive him. Mr Robison's first residence was at the Grove, near Hamilton; but after some years he came to reside in Edinburgh, of which the first account I have was, that he was elected Fellow of the Royal Society of Edinburgh, 22d January 1816, and took part, in 1821, in the formation of the Society of Arts. And here the third and best known part of his life commences, —that in which we are more particularly interested.

" I shall first speak of his connection with the Royal Society. The division of the Physical and Literary Classes of the Society was then more strictly preserved than it is at present. Mr Robison was elected Secretary of the Physical Class in 1823; and upon the retirement of Dr Brewster from the chief secretaryship in 1828, Mr Robison succeeded him, and continued to hold that office till 1840, when he resigned, contrary to the wishes of all those who had been most nearly connected with him in the discharge of the duties of his office. It may be safely affirmed, that, under the favouring circumstances of affluence and leisure, seconded by congenial tastes and singular habits of order, he conducted the affairs of the Society with more watchful and anxious superintendence than is often found in such cases; and during the course of years already mentioned, the care and direction of our affairs might be said to be his chief business; for, unencumbered by any professional demands on his attention, he passed successively from object to object of the many schemes, inventions, and projects, which successively occupied his attention, but he always attached himself to the concerns of our Society as his chief and main occupation. Having been, even before my admission as a Fellow, in frequent communication with Mr Robison, and almost ever since, until his retirement, having acted as his co-operator and junior Secretary, with the valuable co-operation of my senior, Dr Christison, I have had innumerable opportunities (and I know that Dr Christison will unite in the same statement) of observing the unbounded pains which he took, publicly and privately, of fulfilling what he considered to be his duty, and of maintaining, at any sacrifice of trouble, the rights of the Society, and those of its members. In particular, we owe to him, in conjunction with our worthy President, Sir Thomas Brisbane, the endowment which we receive from Government, and which places this Society upon a surer footing of independence and respectability than any other circumstance connected with its affairs which has occurred for many years.

" Sir John Robison, as we must now call him (for he received the honour of the Guelphic Order from King William IV. in 1837, and of Knighthood from the present Queen in 1838), rarely contributed to our scientific proceedings, and the circumstance is worthy of remark: his only printed paper being one on Whitelaw's escapement, and the time-keeper set up in our Hall.* This can only be attributed to one cause, to a motive, in fact, highly honourable to him. Sir John Robison never made any pretension to be considered as a fully accomplished man of science, although, undoubtedly, many persons have been ranked as such upon very inferior claims. It was part of his character. Like Dr Wollaston, he had the most precise and methodical line of demarcation between what he wished to be considered competent to decide, and what he declined offering any opinion upon. It was a caution which might be well deemed excessive, as his real acquirements were undoubtedly greater than even his intimate friends were fully aware of. His own opinions also were, for the same reason, often sheltered under the impersonal form. In almost no instance that I recollect of did he suffer his name to be put as a responsible member of a Committee of the Council to decide on the merits of purely scientific communications. Nor could this have arisen from any unwillingness to such occupation or responsibility; for in another Society, of whose general business he considered himself a competent judge, no one was more active in such capacities. His backwardness in this particular can only, therefore, be ascribed to a very strict appreciation of his own acquired knowledge. His youth and middle life were spent, as we have seen, in circumstances little favourable to the acquirements of abstract science, or of literary dexterity. When leisure permitted, he did not become a regular student, which could hardly be expected at his time of life; and he seldom made a profound or consecutive study of any of the scientific topics which continually presented themselves to his acute remark during his multifarious occupations. Thus, when he associated with scientific men, after so many years spent remote from European society, he was generous enough rather to throw useful hints in the way of others, and to aid their prosecution, than to hoard the many happy ideas which he struck out, or present views essentially philosophical in a crude or merely practical form. I conjecture, too, that, clearly as he at all times expressed himself, whether in conversation or in writing, he had a sort of dislike to formal literary compositions, which contrasted with his father's extraordinary fluency in this respect, and which hindered him from attempting them. This may be inferred from the paucity of his acknowledged compositions during so active a life, which consist only, so far as I know, of the paper on Whitelaw's Timekeeper already mentioned, an article on Turning, in the Edinburgh Encyclopædia; a description both in English and French (at least the latter), of two Plates published by Mr John Milne, of a large Pumping Steam-Engine; an account of the failure of a Suspension Bridge at Paris, and another paper in the Edinburgh Journal of Science, and two or three of the numerous communications presently to be mentioned as contributed to the Society of Arts.

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* Edin. Trans., vol. xi., p. 345. This paper was read 7th Feb. 1831.

"In all other respects than as a contributor, his services to the Royal Society were numerous and incessant. By his example and assistance, its affairs were conducted in a more methodical and exact manner than had previously been usual; he kept more exact minutes than had before been done; he contributed to our Museum and its re-arrangement; he charged himself almost exclusively with the editorial labour of our Transactions; and, by his extensive acquaintance with the scientific men of Paris, where he was himself favourably known, he also extended the connections and character of this Society.

"But whilst thus intimately connected with the Royal Society, he took a great deal of concern in another, the Society of Arts, which he had contributed to establish, of which he acted as Secretary from 1822 to 1824, and of which he was twice Vice-President, and finally President for the year 1841–2. By far his most numerous public communications were to that Society, and the complete list of them which the present Secretary, Mr Tod, has, with great courtesy and labour, extracted for me from the minute books, includes about 60 contributions of one kind or other, spread over a period of 17 years. It would be wrong to judge of these communications as formal papers; the nature of the proceedings of the Society admitted of merely verbal and occasional notices not necessarily of an original character. During his frequent visits to Paris he seldom failed to pick up some improvement in the ornamental or useful arts, which he thought worthy of being known to practical men at home, and farther publicity he did not desire. Such were many of his communications; others of very various degrees of importance were properly original, comprising the results of his own experiments on mechanical subjects. And though many of these appear trivial by the titles, few persons capable of judging of or appreciating the ingenuity of his improvements, or the beauty of the workmanship by which he rarely failed to illustrate them, considered them really to be so. To myself, who was for a long period a constant visitor of his workroom, these memoranda recall the rapid succession of most ingenious plans and contrivances with which he was almost continually occupied, and of which only a very small part ever underwent even a partial publication. Amongst the more prominent of his communications to the Society of Arts may be reckoned his improvements in the difficult art of cutting accurate metal screws, for which the Keith

Medal of that Society was awarded to him, after a sufficient interval had elapsed to test the utility of the invention, which is declared by the Committee who examined it, "from the numerous testimonials by practical men in favour of the method described, and detailing the superiority over others in use, to deserve the highest mark of the Society's approbation." An honorary medal was soon after awarded to Sir John for a notice of experiments on the Forth and Clyde Canal, on the resistance to vessels moving with different velocities,—a subject of great interest and importance, then newly brought into special notice, from the ascertained possibility of tracking vessels advantageously at a high speed. Amongst other subjects of general interest included in his communications were the application of hot air to warming houses; of gas to the purpose of illumination, and also to the purpose of heating. These two last subjects, which admit of a great deal of practical sagacity in their study, were for many years almost constantly under his notice, and many of his friends recollect his success in organizing a kitchen in which gas was the chief combustible.

"It may, no doubt, be matter of regret that Sir John Robison did not apply more of his attention to practical problems, the solution of which would be of extensive value. The truth is, that the occupations of his life in Britain were only pastimes, and he never attached to them a very serious importance. I may mention one instance which came to my knowledge, of a practical suggestion, I believe of his own, which is undoubtedly of much utility. He remarked to me, a few years before his death, that the construction of astronomical instruments appeared to be much misunderstood by opticians, who are generally by no means skilled in the engineering of structures, or in mechanics on a large scale. Most astronomical instruments, whether large or small, have been, from the earliest times, constructed of a *multitude of detached fragments*, screwed and clamped together, very elegantly, indeed, but with a complete sacrifice of the firmness to be gained by solid castings. For large instruments, especially, Sir John observed that a Manchester machine-maker would turn out a far better article than the best optician in London has the power of making, wanting the necessary implements. I was much struck by the remark, and not long after I heard exactly similar views expressed by Mr Airy, the Astronomer-Royal, who has detailed them in an able paper in the *Notices of the Astronomical Society*, 13th May 1842, where he describes a zenith sector, constructed upon engineering principles, identical with those of Sir J. Robison's, the principal pieces having been both cast and worked by Messrs Maudsley.*

"To sum up here what may be said on Sir John's mechanical talents, it may be affirmed, that his intimate acquaintance with Technology or the useful arts, was equalled by very few persons living. Many persons who have been delighted by the exquisite specimens of handiwork produced by his own lathe, may have supposed that his sagacity consisted in what may be called neat-handedness. But it was so far from being limited to this, that he may be said to have possessed a minute technical acquaintance with a host of different trades; and such combined knowledge is an uncommon and valuable acquisition in itself. Any one who had occasion to ask advice or information on any point of the numberless operative professions into which modern ingenuity and modern luxury have divided the comparatively few practical trades known a century ago, were rarely disappointed in receiving from Sir John Robison a clear and categorical answer as to the processes and materials in use, and not unfrequently a suggestion for their extension or improvement. I can safely say that for many years our late Secretary was to me an unfailing referee upon such questions; he formed a valuable link between the men of theory and the men of practice of our time. Amongst my own acquaintance, Mr Babbage and Professor Willis are the only persons who could be brought into comparison with him in this respect.

"This extensive technical knowledge had several antecedents. First, may be ranked a larger share of theory than he ever took credit for, or than any one would readily have supposed that he possessed; this I have only learned by casual circumstances: Secondly, a continual intercourse with well-informed persons in every department of art,—not only with such men as the present Mr Watt, who has kindly communicated to me his own testimony to the value set upon Sir John Robison's talents and acquirements, not only by himself, but by his illustrious father, and by Messrs Boulton and Murdoch his coadjutors in the Soho establishment, or as Mr Peter Ewart, formerly of Manchester, then of Woolwich, or as the late Mr Barton of the Mint, or Mr Oldham of Dublin, who were his particular friends,—but with the wholesale and retail manufacturers and engine-makers of Birmingham, and more particularly of Manchester, where

* I cannot affirm positively that Sir J. Robison's opinions were original to himself, but I understood them to be so; and I know that his conversation with me long preceded the date of Mr Airy's paper.

he retained the connection of a constant friendly intercourse, which probably in many instances dated with his residence in that town at his outset in life. He was also intimately acquainted with the workshops of numberless ingenious tradesmen, not only in the strictly manufacturing towns of England, but in London, Edinburgh, Glasgow, and Paris, by whom he was known and valued. But, thirdly, all this would have been unavailing, had he not practically executed his own designs, and learnt, by experience, more or less of the difficulties of almost every trade which came under his notice. The varieties of the constructions which he executed shew great diversity of acquirement. From boring a cannon to drilling a needle's eye, nothing was strange to him ; the first, we have seen, was amongst his earlier serious occupations, the last was a problem which occupied him not long before his death. Masonry, Carpentry, and manufactures in metals, were almost equally familiar to him ; his house in Randolph Crescent was built entirely from his own plans, and nothing, from the cellar to the roof, in construction or in furniture, but what bore testimony to his minute and elaborate invention and superintendence. A door handle, a chair castor, a pair of tongs, and a candlestick, he deemed equally worthy of attention with the more important particulars of warming and ventilation, security from fire within, and from wind without. Some panes of glass having blown in by a storm, he was led to some curious observations (communicated to the Society of Arts) on the proper mode of placing window-glass in the sashes. Many particulars of his minute and ubiquitous experience may, I think, be found in different parts of the useful writings of the ingenious Mr Loudon, with whom he was in frequent correspondence. The poet Cowper says, "How various his employments whom the world deems idle." And those who knew Sir John Robison well, and who know at the same time the immense expenditure of time required for attaining mechanical dexterity in any department, or, when attained, the labour necessary to produce even the smallest or simplest object when of exquisite execution, wondered how he was enabled to perform so much. His correspondence alone would have been more than an ample occupation to most persons. The secret lay, as in all such cases, in habits of perfect order, of never doing two things at once, and of devoting his whole thoughts and skill to what immediately occupied his attention ; but to this we must add habits of great personal activity, which throughout his life rendered him incapable of sleeping for more than a short period, and a powerful constitution, which enabled him for long periods almost to dispense with exercise.

"There were other public bodies in which he took an interest besides those which have been mentioned; but they may be briefly passed over. For a number of years he was an active member of the Highland Society, and commonly Chairman of their Committee on Agricultural Implements and Machinery. He assisted in the formation of the British Association for the Advancement of Science at the meeting at York in 1831; and he acted most energetically in the capacity of Local Secretary to that body upon occasion of its visit to Edinburgh in 1834, when he also entertained M. Arago at his house. Nor did he think the regulation of the affairs of the City Police below his notice; and, like the distinguished scientific foreigner and friend just mentioned (whom I have heard dilate as warmly upon the achievement of paving a *boulevard* as upon the discovery of a comet), he sat for some years amongst the Police Commissioners, and suggested some improvements, generally felt to be such, though the originator is not so commonly known. He would undoubtedly have introduced many others; but his coadjutors probably thought more of saving the public money, *he* of the public convenience.*

"Before closing this brief notice I have pleasure in adverting to a trait of our late Secretary's character, which did him honour. I mean his sincere desire to render himself useful to those with whom, as officially representing the Society, or from congeniality of pursuit, he was brought in contact. It may be, that all whom he thus favoured were not equally deserving, but that, as a general rule, he endeavoured to attract notice to merit cannot be doubted. The slightest recommendation, or none besides ingenuity, were sufficient to claim an interest in him, and during many years his house and his table were hospitably open to those who asked his advice or required his encouragement. I have a pleasure in recording my personal obligations to him at a time when I had scarcely a single scientific friend; when, and for long after, I received from him such substantial proofs of kindness, as it is impossible that I should ever forget.

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* The method of naming the streets in a conspicuous and durable manner was a favourite topic with him, and it is a duty of the police certainly too much neglected, more especially in London. The substitution of our present cast-iron lamp-post, with the name of the street cast on each, replacing the expensive, ugly, and ineffective construction of the old ones, was, I believe, due to Sir John.

The considerable number of foreigners who annually visit Edinburgh, and to whom his leisure was always dedicated, found at his house almost a home; and as he spoke the French language with fluency and correctness, his society was invariably sought by them, whatever might be their department of study, their country, or political opinions. The exiled Royal Family of France, and their numerous friends, had, during their stay in Edinburgh, reason to be gratified by his attentions, and they shewed that they were so. Down to the period of his death he remained in correspondence with some of those whose acquaintance he then made; and their letters shewed that his zeal for their interests was not restricted to the period of their stay in this country.*

"Sir John Robison was, like his distinguished father, of a tall and commanding figure. No likeness has, I believe, been preserved of him, except a daguerreotype and some calotypes, done shortly before his death. One of these is an admirable portrait. In general he enjoyed excellent health, and was scarcely ever absent from the meetings of any society which he usually attended. A considerable deafness, which affected him for the last two or three years, was, however, exceedingly irksome to him, and interrupted this regularity. Although subject for many years (at least since 1831) to occasional palpitation of the heart, he kept disease at a distance by habitual abstemiousness; and his constitution did not appear to suffer any shock until the 6th February 1843, when he abruptly quitted his usual place at the table of the Royal Society Club, owing to some indisposition, which did not, however, immediately assume a threatening form. The activity of his mind did not desert him; for, on the 27th February, he gave a notice of Messrs Naysmith's beautiful invention of the Steam Forge-hammer at the Society of Arts, which was also the principal subject of his last personal communication with myself. His death, which took place after only a few days' illness, and which was occasioned by the rupture of some important bloodvessel, occurred on the 7th March 1843, being then in his 65th year."

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* A letter to him, from one of the exiled French nobility, which arrived a few days after his decease, was filled with commissions involving no common trouble and responsibility, which he was requested to execute.

2. On a method of rendering Magnetical Instruments Self-Registering. By J. A. Broun, Esq. Communicated by Sir T. M. Brisbane, Bart.

A sheet of paper being stretched tightly across a flat frame, if fine iron filings be dusted uniformly over it, and a fine pointed sewing needle, magnetised to saturation, held vertically, be moved below it, the point being kept at a short distance from the paper, the motion of the needle-point will be indicated by a fine line of filings which, attracted by the magnet, separate themselves from the homogeneous dust around. The fineness of this line will depend on the sharpness of the needle point, and the smallness of the particles of iron; the distance of the point from the paper will depend on the strength of the magnet, and the smoothness of the surface on which the particles lie. In some experiments already made, lines have been obtained as fine as could be produced by the sharpest pointed pencil, and this with a portion only of a small sewing needle. It will require a more extensive series of experiments to determine the best size for the magnet, and the best kind of paper for the filings. The particles of iron having a certain weight, are not easily shaken from their position if moderate care be taken.

If a fine needle be placed vertically at one extremity of a declination magnet, and a sheet of paper dusted with iron filings be moved by clock-work, in the direction of the magnetic meridian, the oscillations of the magnet towards the E. or W. will be indicated in the iron filings by the corresponding motions of the vertical needle.

One scale division of the declinometer used in the Makerstoun Observatory is equivalent to about 40″, and a tenth of a division or 4″ can be estimated: with the addition of a light and rigid rod to the declination magnet, by means of which the vertical needle could be placed at a distance of about three feet from the suspension thread, a change of declination to the amount of 6″ would be equivalent to a motion of ·001 of an inch at the needle, a quantity which may be estimated with the aid of a scale and vernier.

Mr Brown proposes to convert a vertical into a horizontal motion, by employing the influence of a magnet moved vertically upon another suspended horizontally. In this way he intends to measure the movements of the vertical force magnetometer, and of the common baromoter, by means of a floating magnet.